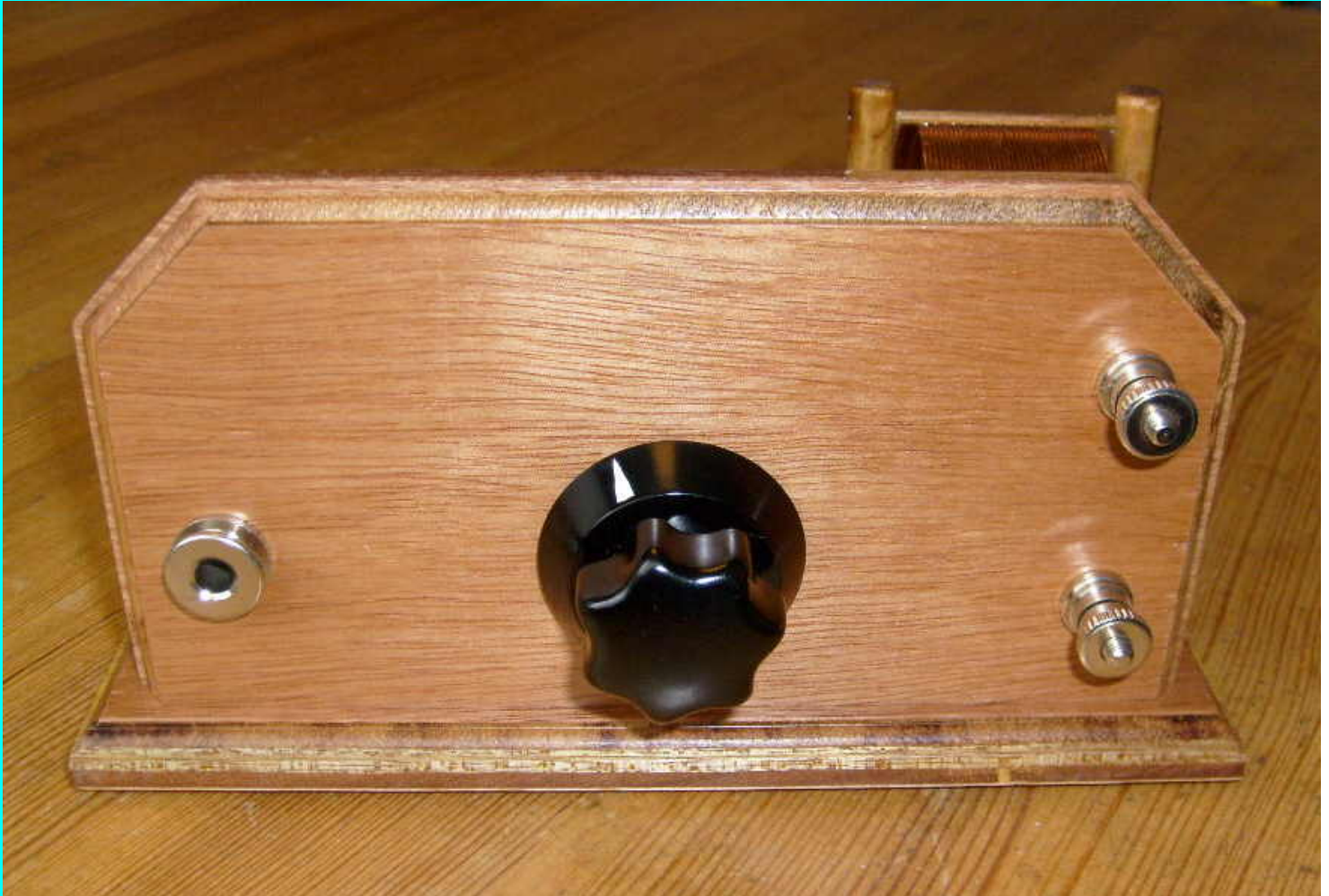


Crystal receiver set 11

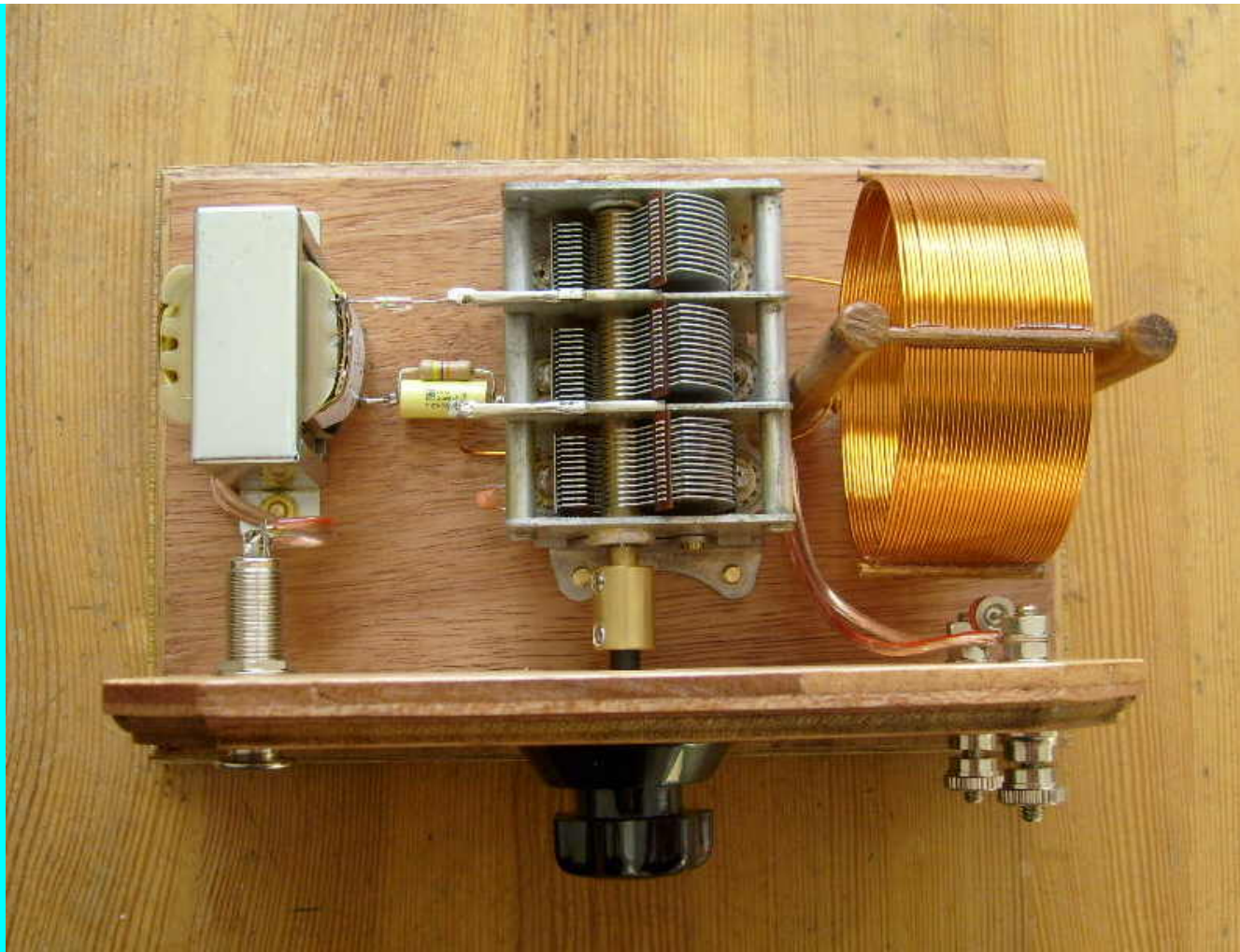
[Back to the index](#)

This receiver has a single tuned circuit, the Q factor of the tuned circuit is quite low.
The receiver can be used well for reception of local stations, for reception of distant stations it is less suitable.

I tried to give this receiver a nice "old-fashioned" look, the reception performance was in this design of less importance.
This receiver is for sale, I made a series production of these, and will build more on request.
This receiver is also for sale as do-it-yourself kit.
See the [shop](#) for more information.

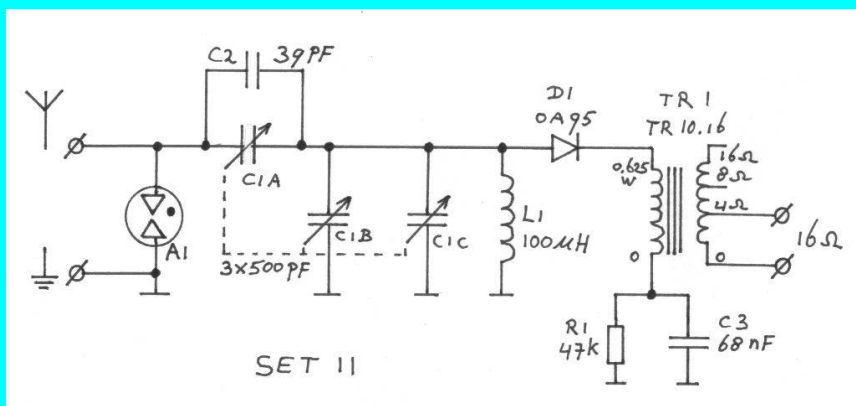


The front panel of the receiver.
On the left side the socket for the headphone.
In the middle the tuning knob.
On the right the connections for antenna (upper) and ground (lower).



Top view of the receiver.

Circuit diagram of receiver set 11

**Circuit description.**

The resonance circuit is formed by coil L1 and C1b and C1c (together 1000 pF).

Capacitor C1a and C2 provide the matching between antenna and tuned circuit.

The frame (rotor) of the tuning capacitor is carrying the RF signal, by this it is possible to tune simultaneously the tuned circuit (C1b and C1c) and the antenna matching (C1a).

Germanium diode D1 provides the signal detection.

Transformer TR1 is loaded with 16 Ω at its 4 Ω output, through this the input impedance increases from 16 kΩ to about 43 kΩ.

At the output a headphone of 2x 32 Ω can be connected, with the two speakers parallel, the impedance is 16 Ω.

Component A1 is a *gas discharge tube* (also called: *surge arrester*) with type number: N81-A90X.

The gas discharge tube protects the antenna input for too high voltages.

These high voltages can occur if the antenna picks up static charge from the air (especially occurs with long outdoor antennas from non insulated antenna wire).

As the voltage at the antenna is higher then 90 Volt, the gas discharge tube will start to conduct and short the high voltage to ground. As soon as the charge has flown to ground, the conduction stops automatically.

Frequency range of the receiver.

Frequency range without antenna: 500 - 2500 kHz.

Frequency range with 10 meter antenna connected: 487 - 1860 kHz.

Both with and without antenna connected, the whole medium wave band can be tuned.

Q factor of the LC circuit (Without antenna and without diode connected):

600 kHz: $Q = 83$

900 kHz: $Q = 81$

1200 kHz: $Q = 75$

1500 kHz: $Q = 65$

The circuit Q is rather low, one reason for this is because the RF signal is in this design on the frame of the tuning capacitor. Because the frame of the tuning capacitor is directly connected to the wooden bottom plate losses occur here.

You can find a complete building instruction on the following pages:

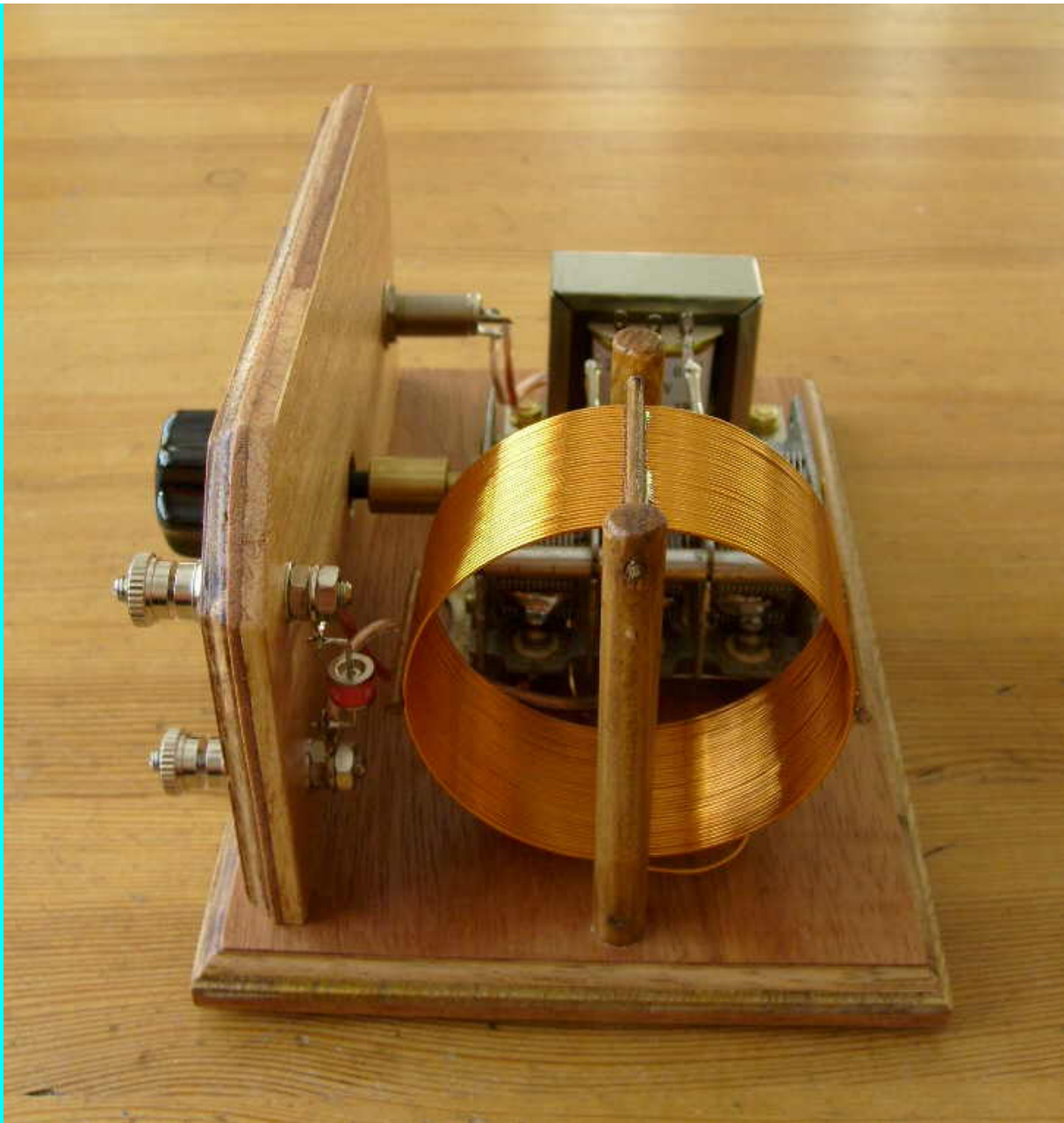
[Step 1](#) Preparing the components

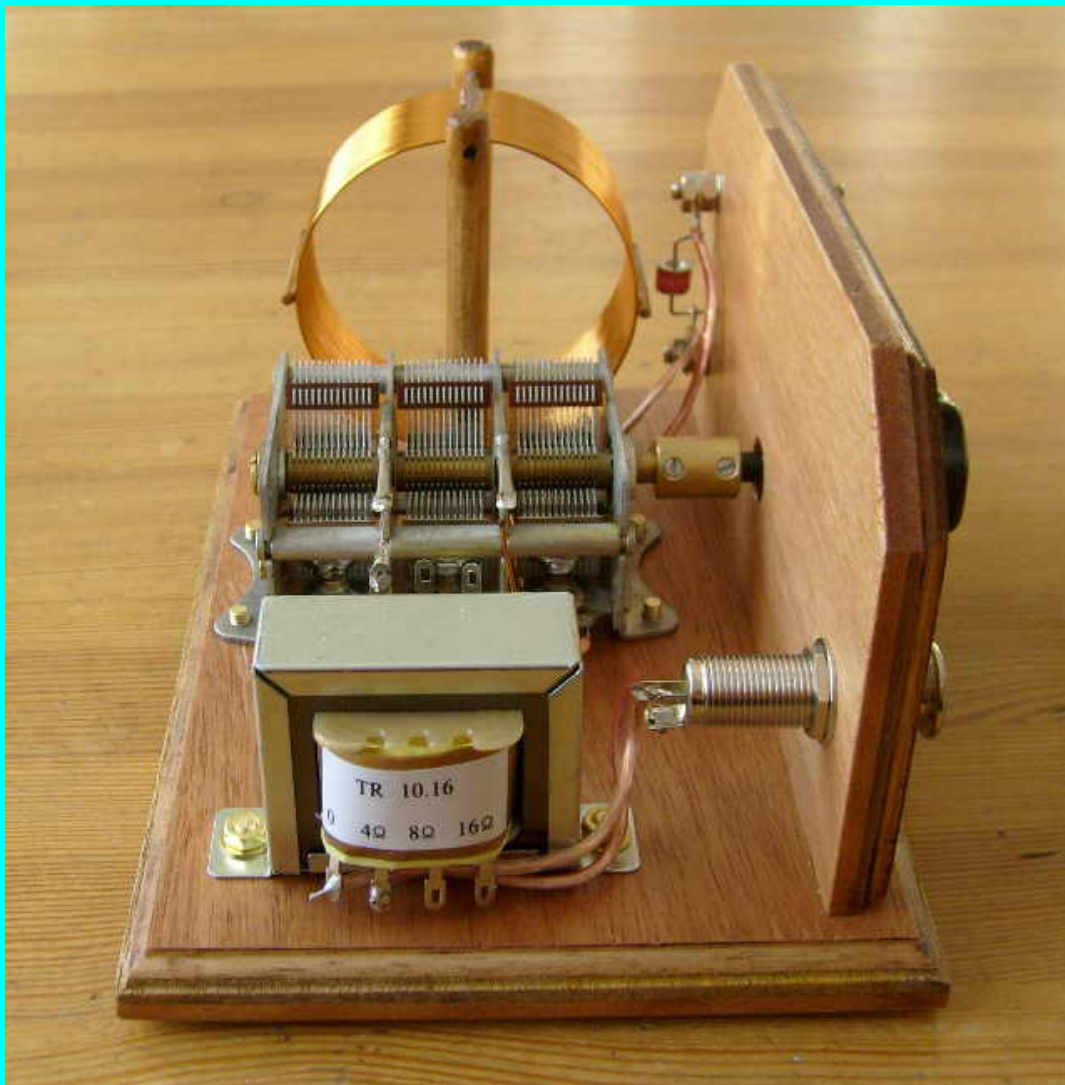
[Step 2](#) Making the frame of the receiver

[Step 3](#) Making the coil

[Step 4](#) Placing the components

You will find [here](#) the part list of this receiver.





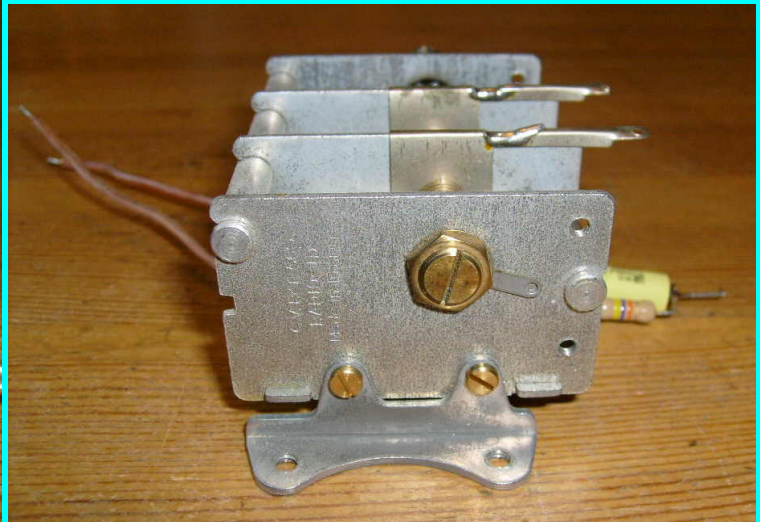
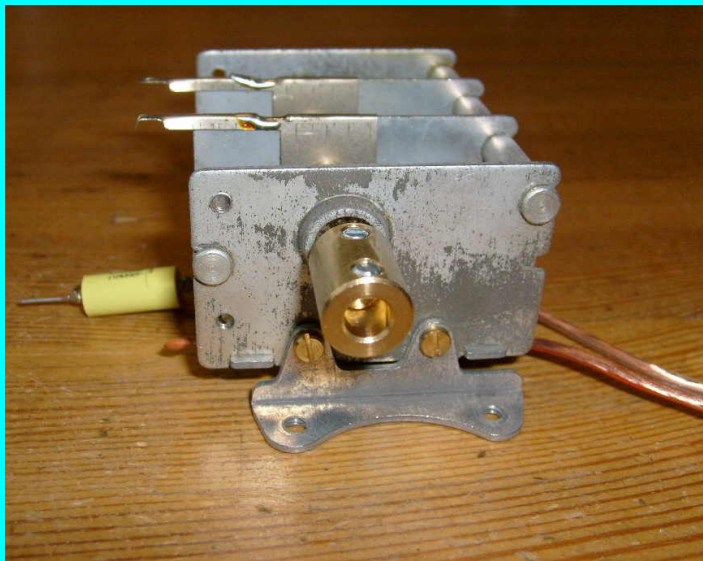
[Back to the index](#)

Crystal receiver set 11

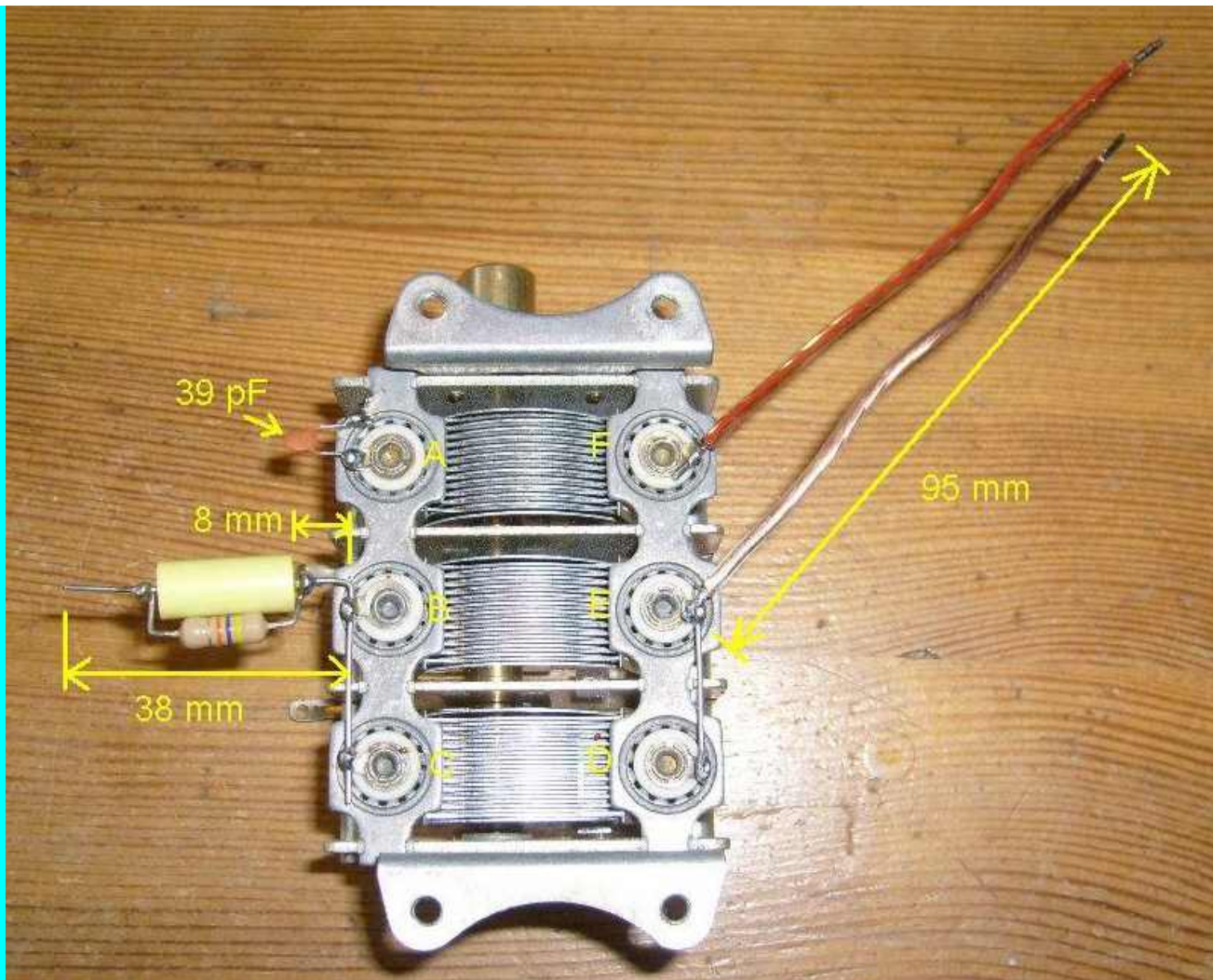
Step 1 preparing the components

[Back to the index](#) [back to set 11](#)

Preparation of the tuning capacitor



Mount the mounting supports on the tuning capacitor (they are delivered with the tuning capacitor).
Place the shaft coupler on the shaft of the tuning capacitor.



Lay the tuning capacitor upside down (in this picture, the shaft is at the upper side).
Bend the 6 solder tags (A,B,C,D,E and F) upwards.

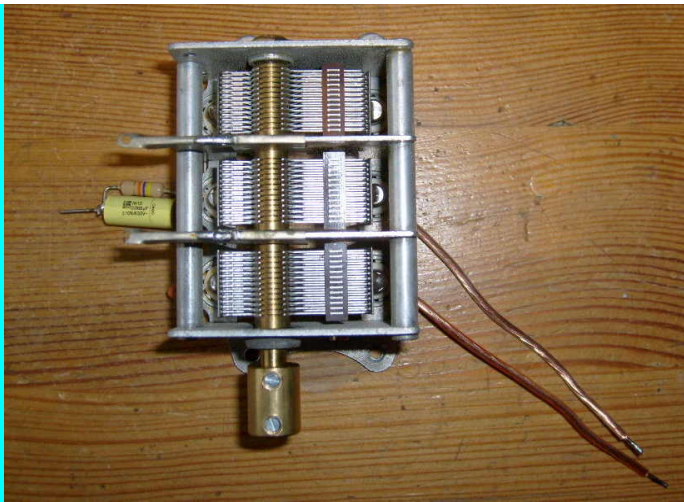
Solder a 39 pF capacitor between solder tag A and the frame of the tuning capacitor.
Scrap (if necessary) the oxide from frame and solder tag, to make the soldering easier.

Mount the 47 kΩ resistor parallel to the 68 nF capacitor.
The wires of the resistor are turned around the wires of the capacitor, and then soldered together.

Bend the wire of the capacitor in a right angle, at 8 mm from the capacitor.
Solder the 68 nF capacitor with one wire to the points B and C of the tuning capacitor, as shown on the picture above.
Cut off the other wire as shown.

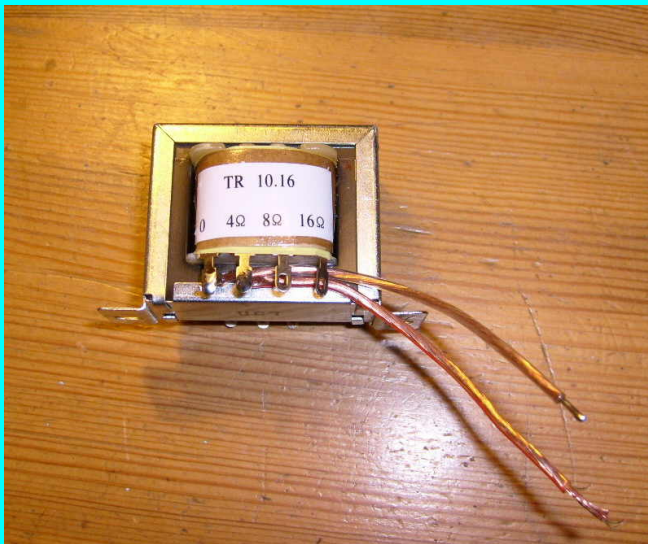
Solder the cut off wire between the points D and E of the tuning capacitor.

Take two pieces of wire with transparent insulation with a length of 95 mm.
Solder one wire to point E.
Solder the other wire (with the red line on it) to point F.
The wires must point in the direction as shown on the picture.



Top view of the tuning capacitor.

Preparations on the transformer.



Solder two wires (length 95 mm) with transparent insulation to the transformer.
One wire to the "0" connection.
The other wire (with the red line), to the 4Ω connection.

Preparing the wooden sticks.



Saw 2 sticks with a diameter of 9 mm to a length of 100 mm.

Drill in each stick 2 holes of 3 mm.

One hole at 6 mm from the end, the other at 81 mm from the end.

Lacquer the blanc wooden sticks with brown lacquer, and then one time with blanc varnish.



Take 2 sticks of about 2.5 mm thickness and about 170 mm long.

Lacquer the sticks with brown lacquer.



Saw the sticks in two.

Preparation of the headphone socket.



The socket for the headphone must be modified as follows:
remove the back part of the ground connection.

Left: the original socket.

Right: the ground connection is shortened.

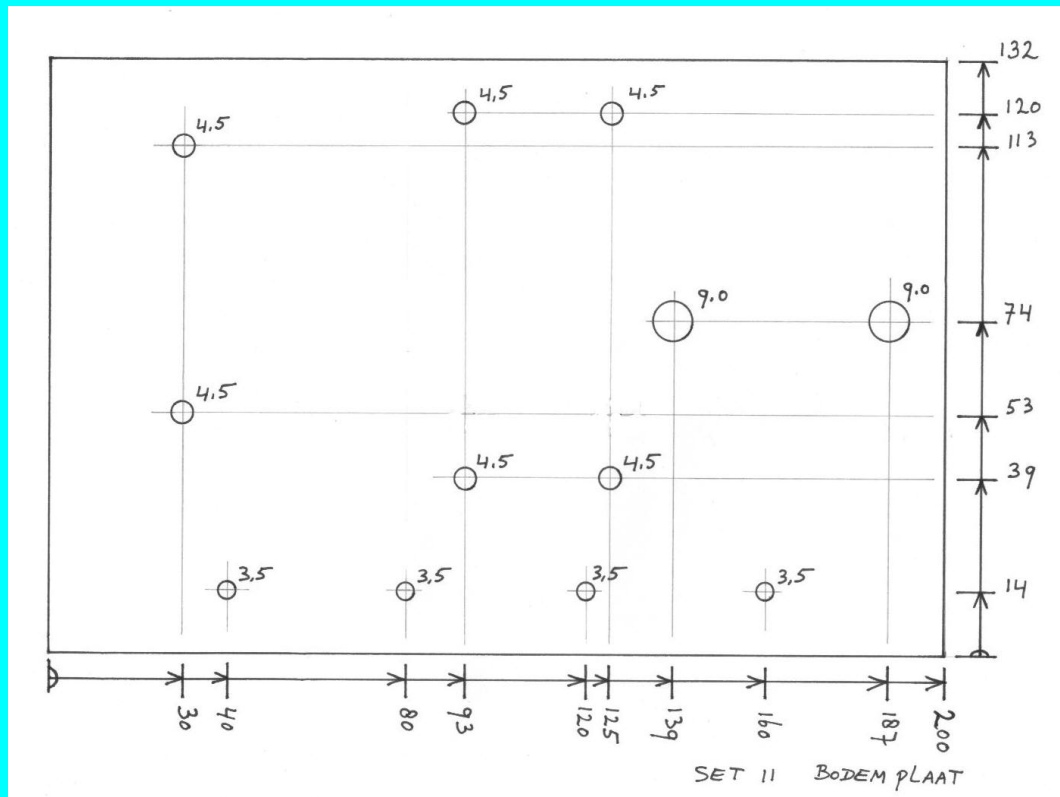
[Back to the index](#) [back to set 11](#)

Crystal receiver set 11

Step 2 Making the frame

[Back to the index](#) [Back to set 11](#)

Saw and drill the bottom plate and front plate corresponding to the drawings below.

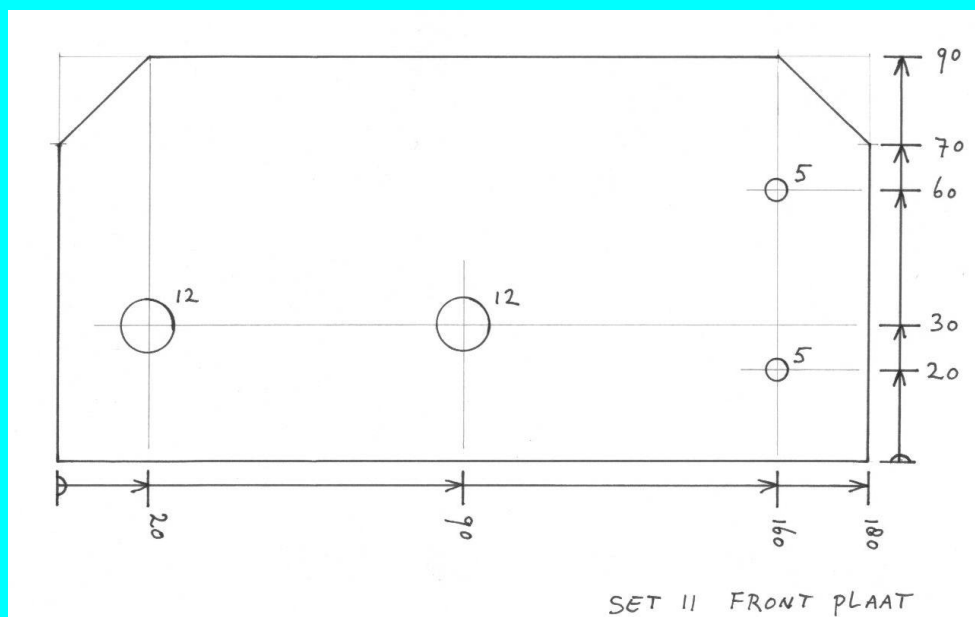


Bottom plate of the receiver (top view).

All dimensions in: mm

Material: 12 mm plywood

All holes (except the 9 mm ones) must be countersunk from the bottom side.



Front plate of the receiver (front view).

All dimensions in: mm

Material: 12 mm plywood.



Bottom plate.

If you have a router, make a profile on the edges.

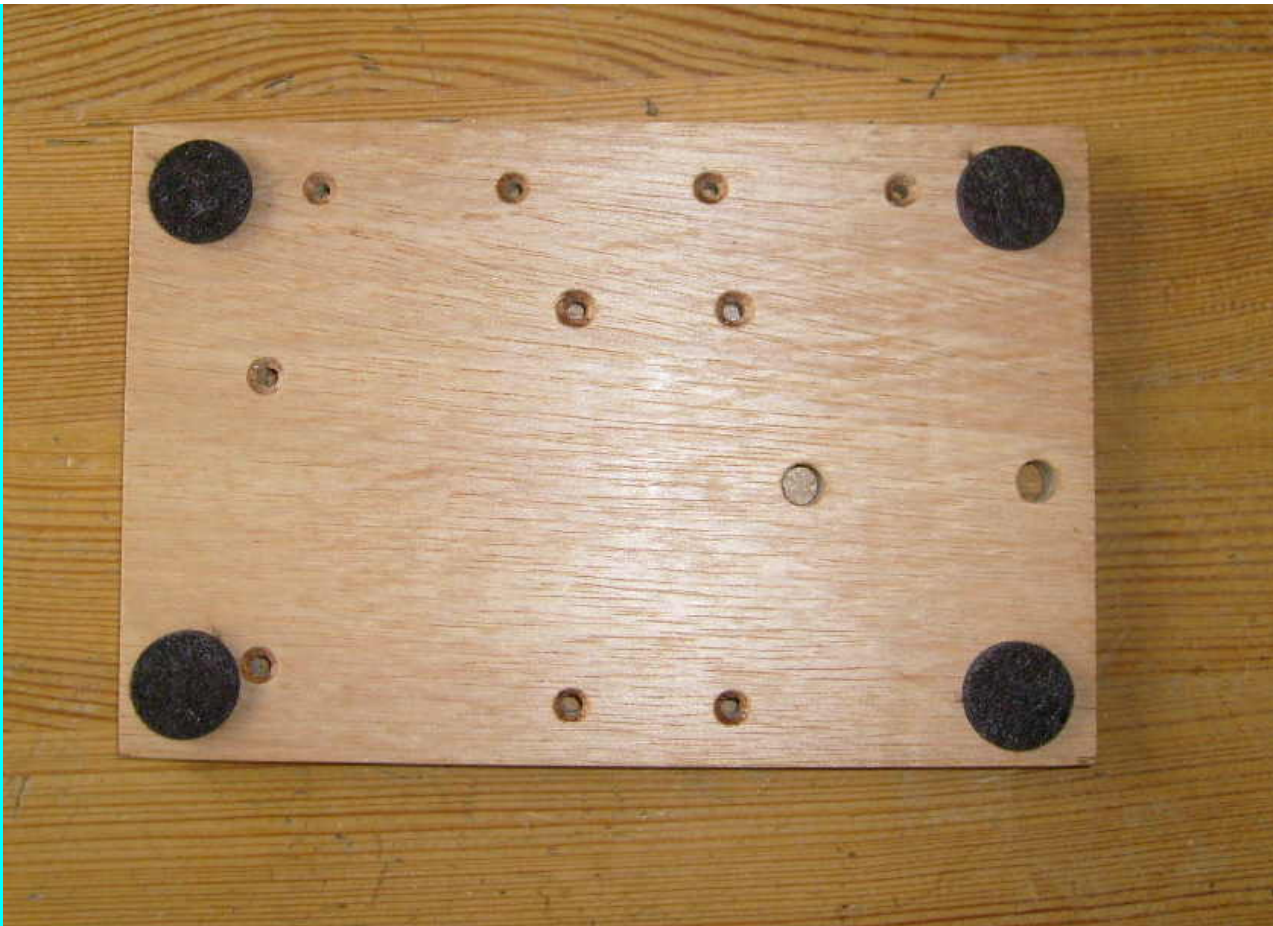
Varnish the wood twice with blanc varnish.



Front plate.



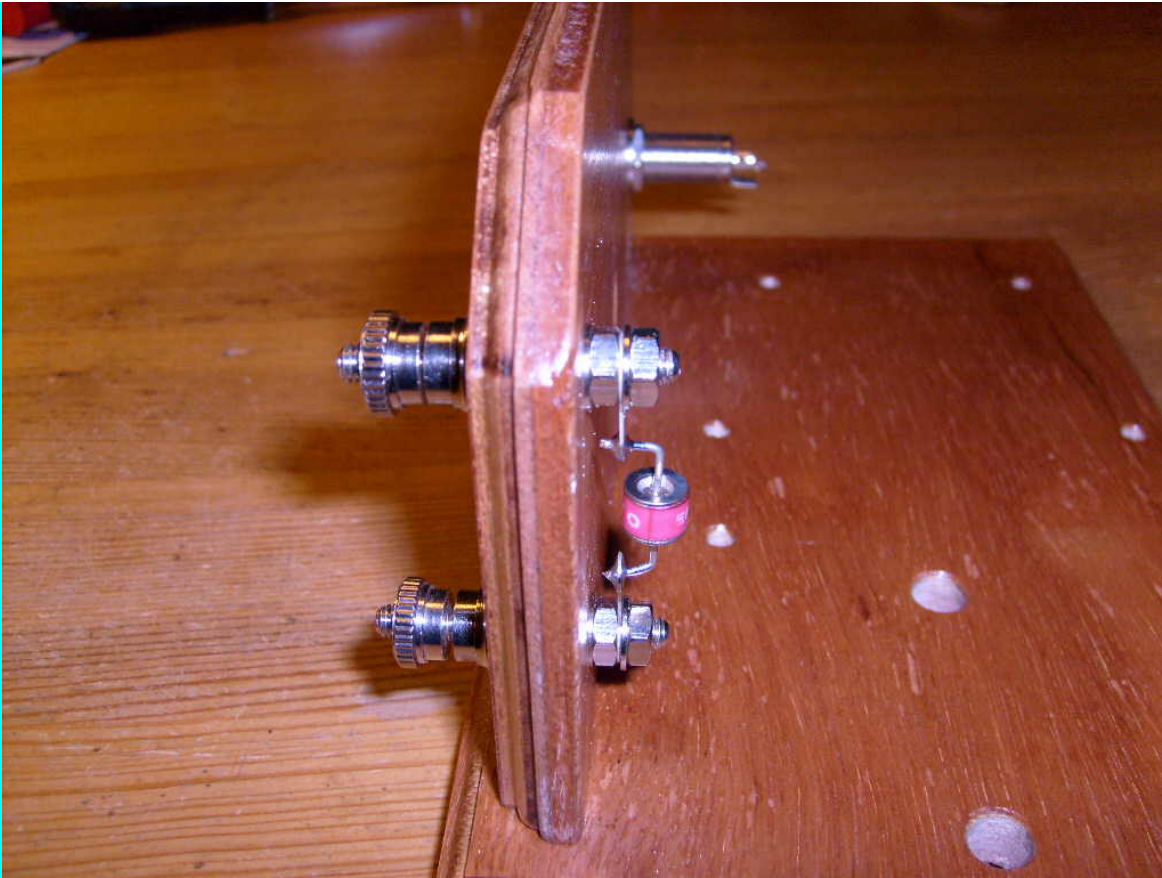
Drill 4 holes (2.5 mm) in the side of the front panel, on the locations for the screws.
This must be done with a drill press.



Stick the adhesive feet on the bottom side of the bottom plate



Screw the front on the bottom plate with four screws 3x45 mm.
Place the headphone socket.
Place the two terminal posts and the gas discharge tube.



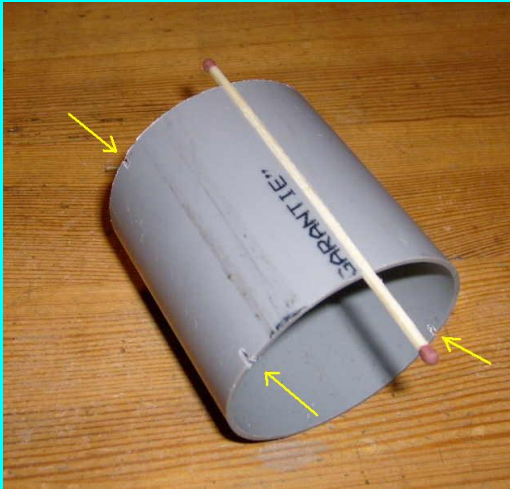
Detail of the terminal posts, and the gas discharge tube.
All nuts of the terminal posts must be tightened firmly.

[Back to the index](#) [back to set 11](#)

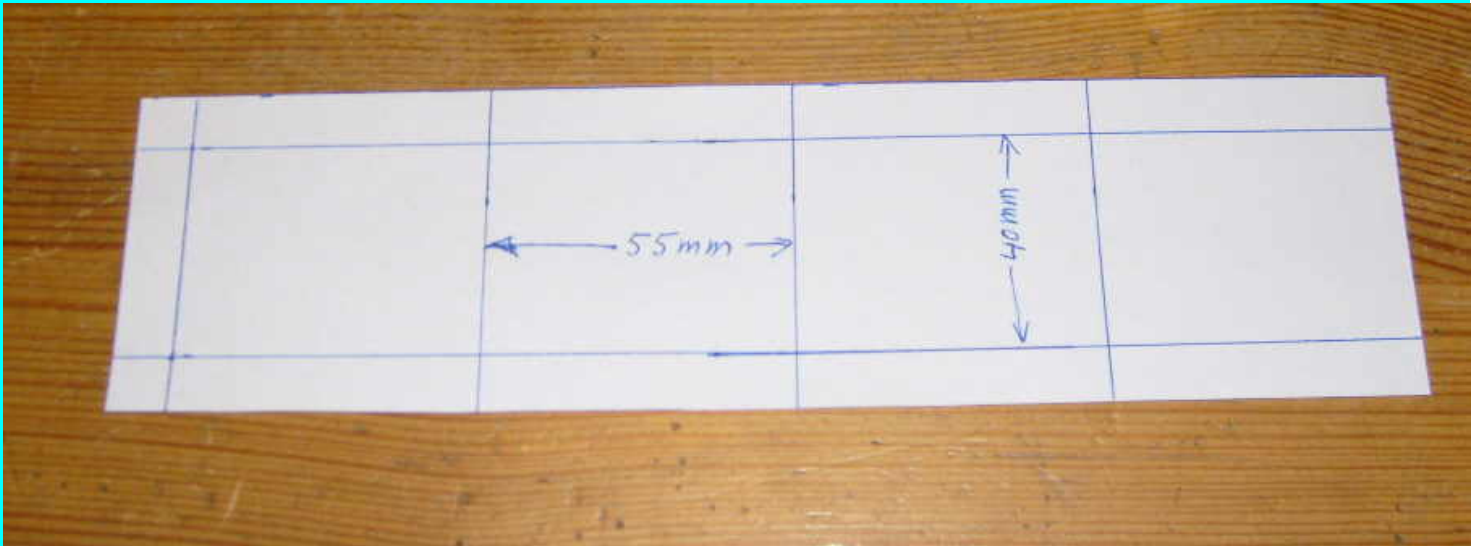
Crystal receiver set 11

Step 3 Making the coil

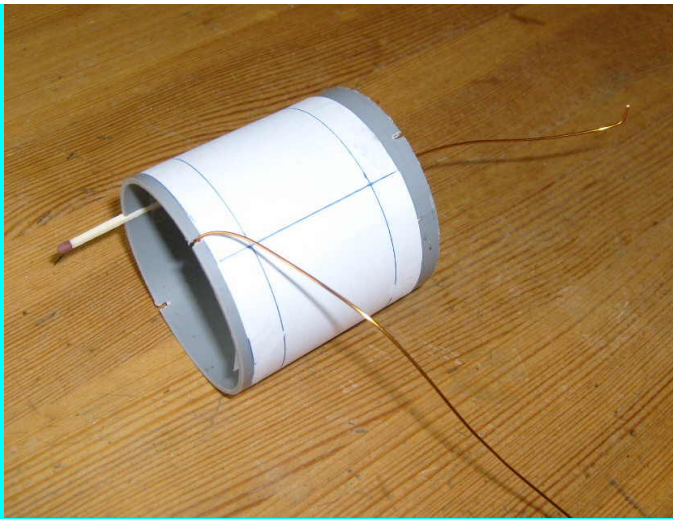
[Back to the index](#) [back to set 11](#)



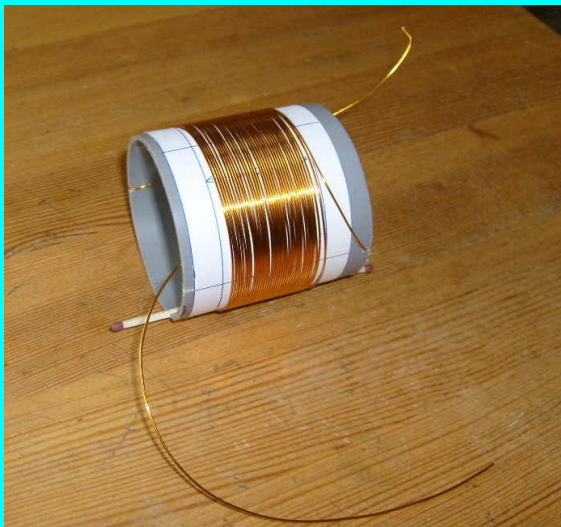
The coil is wound around a 70 mm diameter PVC tube, the length of the tube is about 70 mm. Saw some small slots in the side of the tube (indicated by the arrows), here you can hook on the coil wire. Saw through the tube over its length, and fill this space with two matches. Fix the matches with some tape on the inside of the tube.



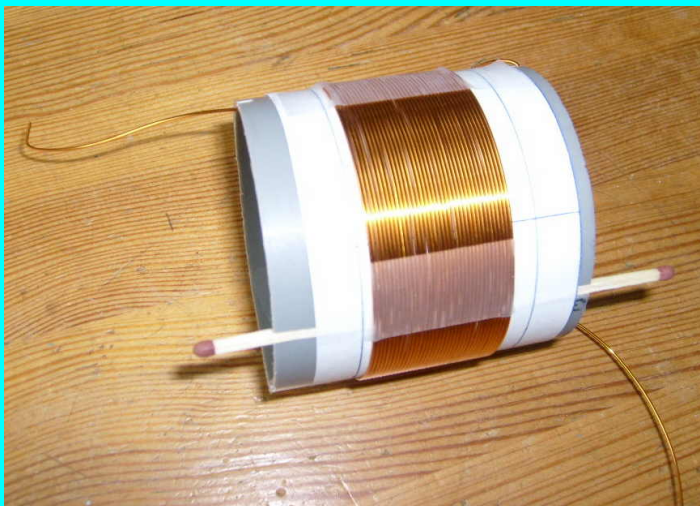
Make a paper strip with 4 sections of 40x55 mm on it. Do the strip around the tube, and fix it with a piece of tape. Don't tape the strip onto the tube on places where later the coil is wound.



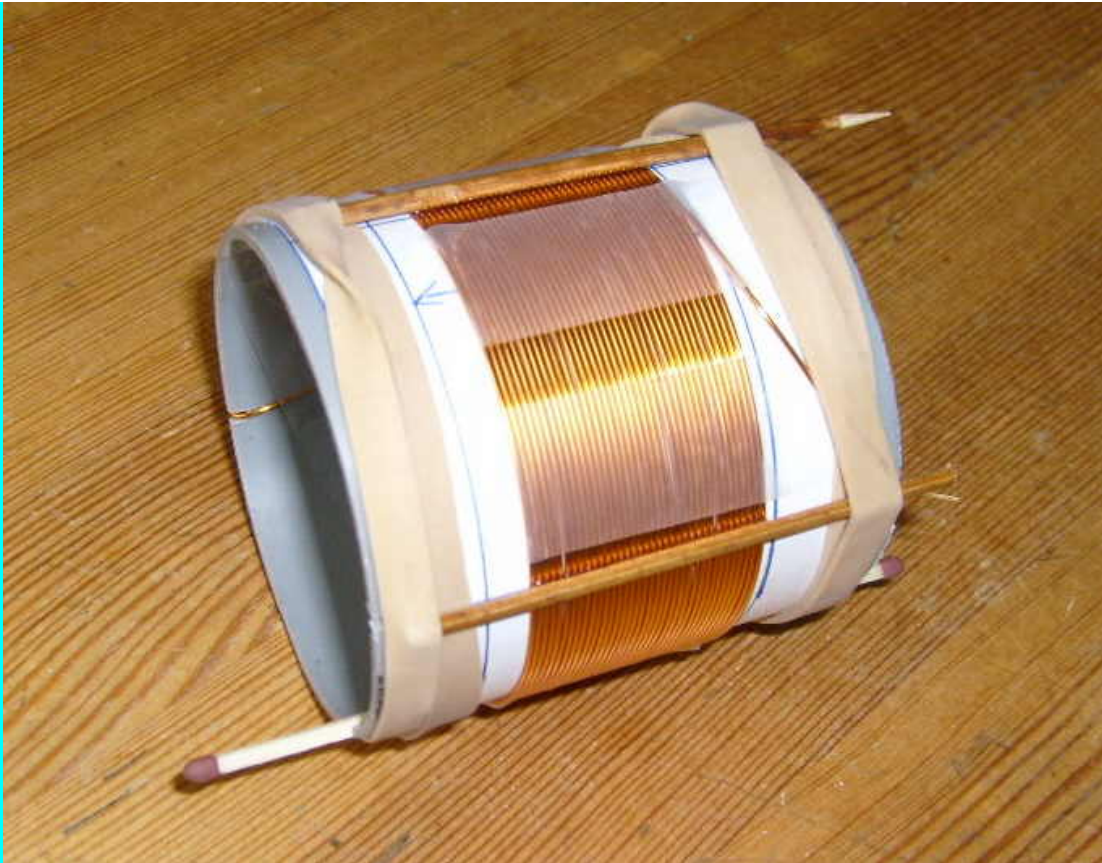
For the coil we need 8.6 meter enamelled copper wire with 0.8 mm thickness.
Hook the begin of the coilwire onto the slot in the tube.
Also fix the begin of the wire on the inside of the tube with some tape.



Wind 36 windings around the tube
Hook the end of the wire onto a slot in the tube, and fix the wire with some tape to the inner side of the tube.

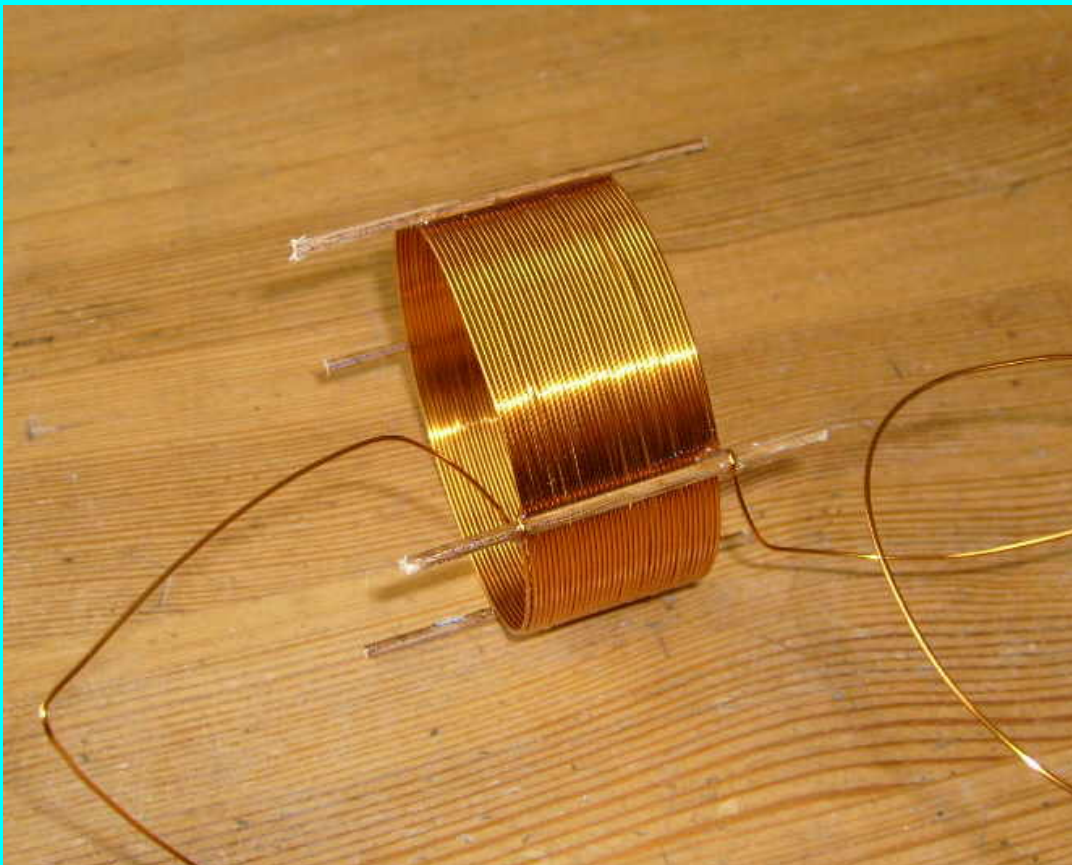


Press the winding to each other, so all spacings disappear.
Do some tape over the windings to keep them in place.



Apply glue on the coil (not on the stick), right above the line on the paper.
Lay the stick on the glue, and fix it with rubber bands.
Do this for all four sticks.

Use transparent 2-component glue.

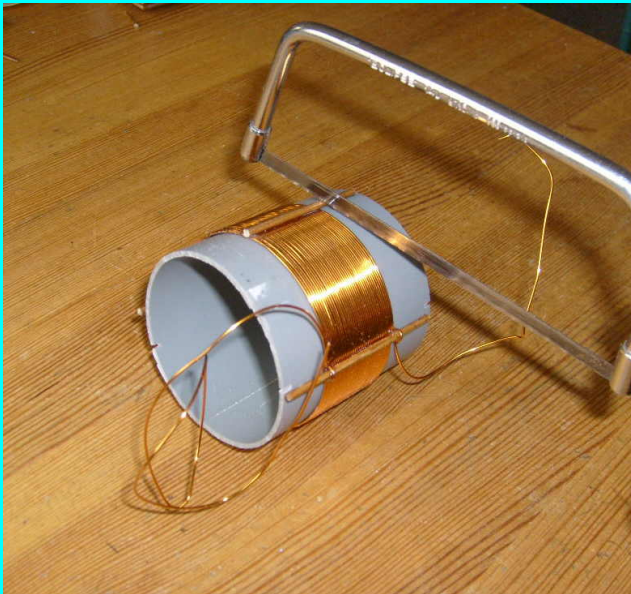


Wait until the glue is hardened.

Remove the rubber bands, the tape and the matches.

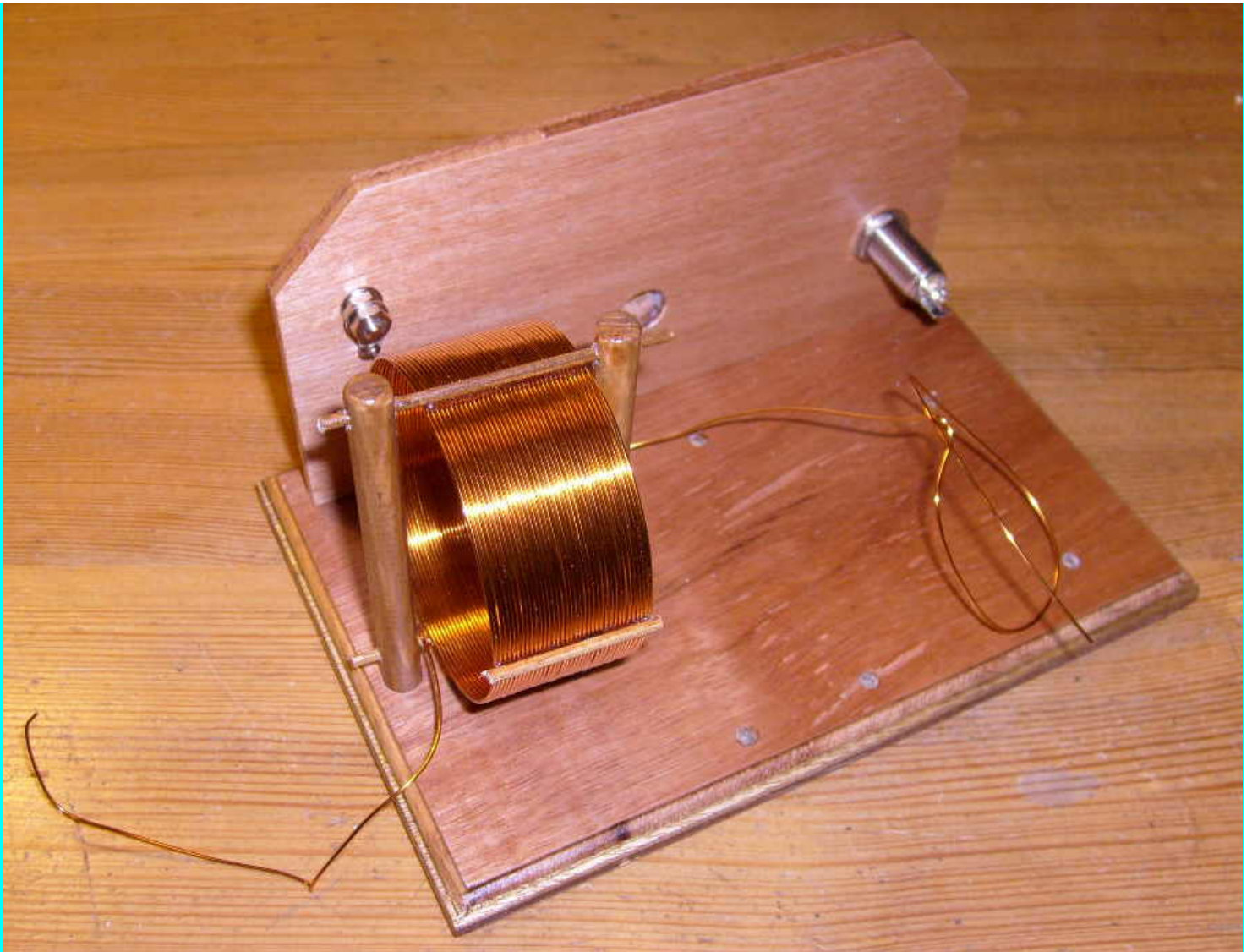
Shift the tube out of the coil, and remove the paper out of the coil.

Turn the both ends of the wire one time around the stick at the bottom side of the coil, and apply some extra glue here.



Saw two sticks on length, somewhat longer then the coil.

The sticks at upper and lower side of the coil must not be shortened yet.



Apply some glue in the holes in the 9 mm sticks
Also apply some glue in the 9 mm holes in the bottom plate.
Place the coil as shown in this picture.
Wait until the glue is dry.

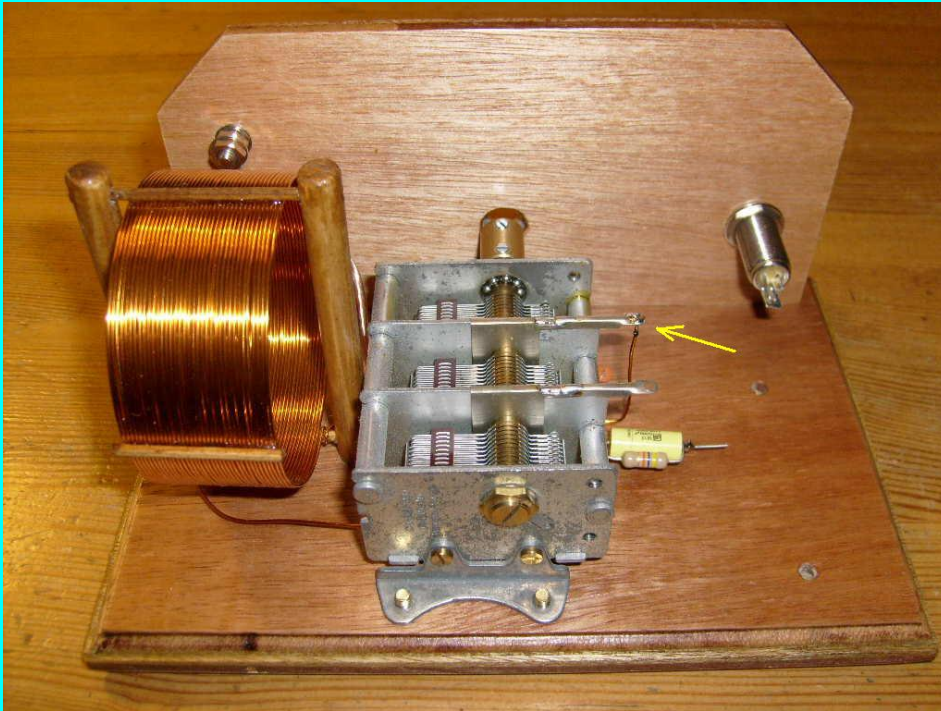
Saw of the ends of the sticks, which stick out of the 9 mm sticks.
Lacquer the sawed ends of the sticks with coloured lacquer, so the colour corresponds with the rest of the wood.

[Back to the index](#) [back to set 11](#)

Crystal receiver set 11

Step 4 Placing the components

[Back to the index](#) [back to set 11](#)



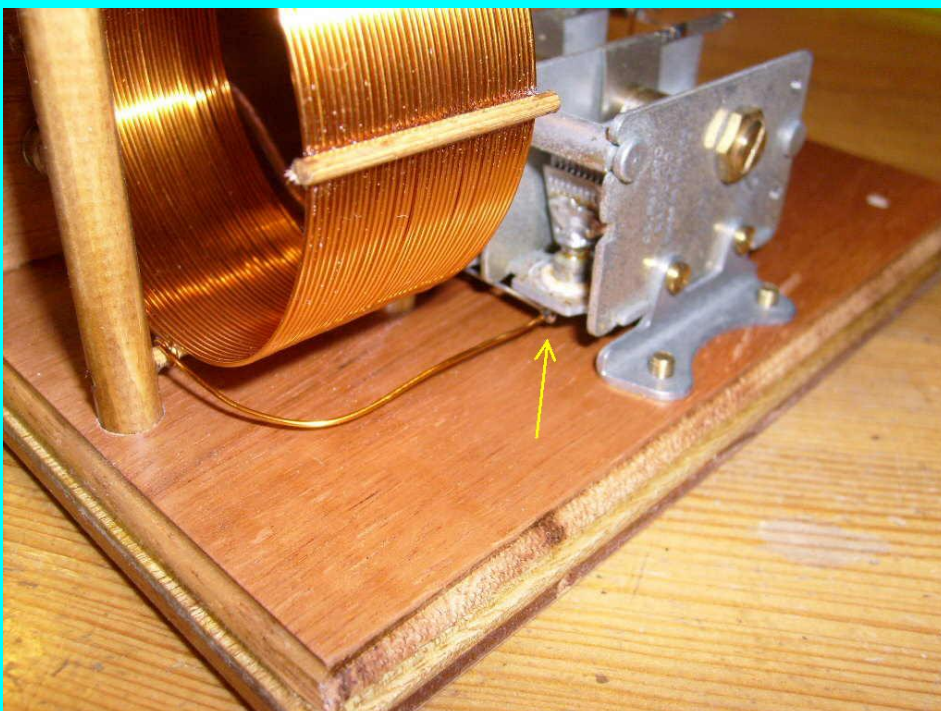
Place the tuning capacitor on the frame.

Fix it with four screws M4x16

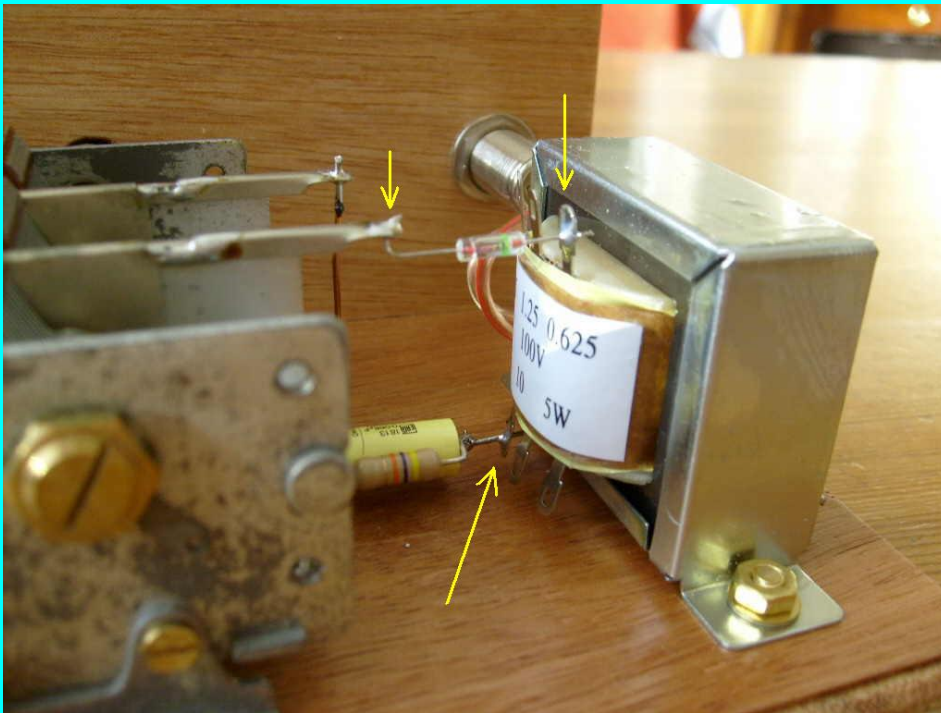
One coilwire runs underneath the tuning capacitor, is then bend upwards and cut to length.

Solder this wire to the tuning capacitor (indicated with the arrow in the above picture).

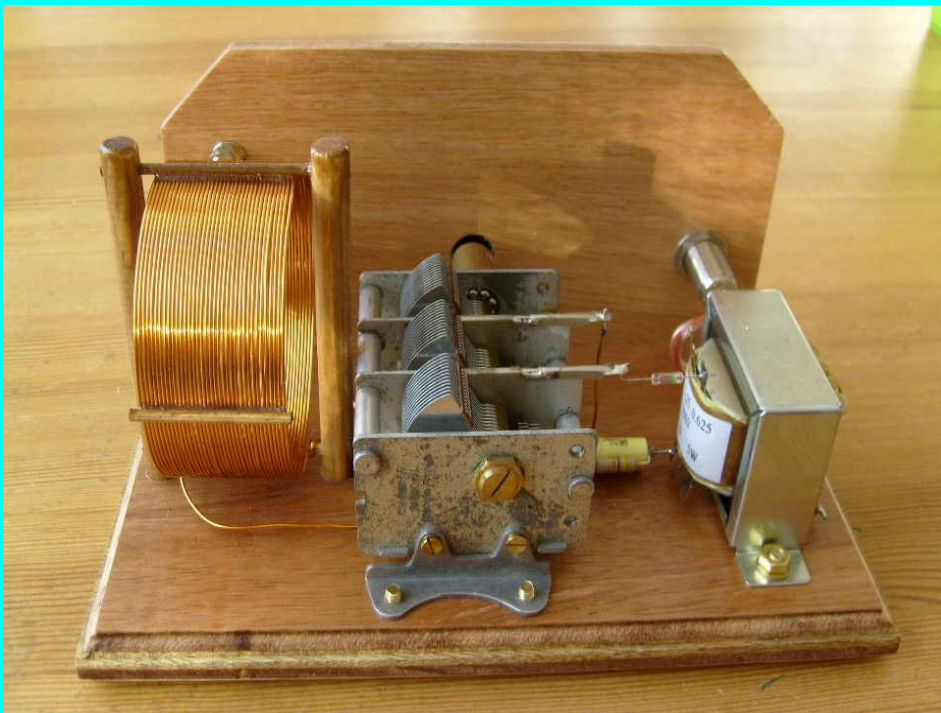
Scrap of the lacquer from the wire, before soldering.



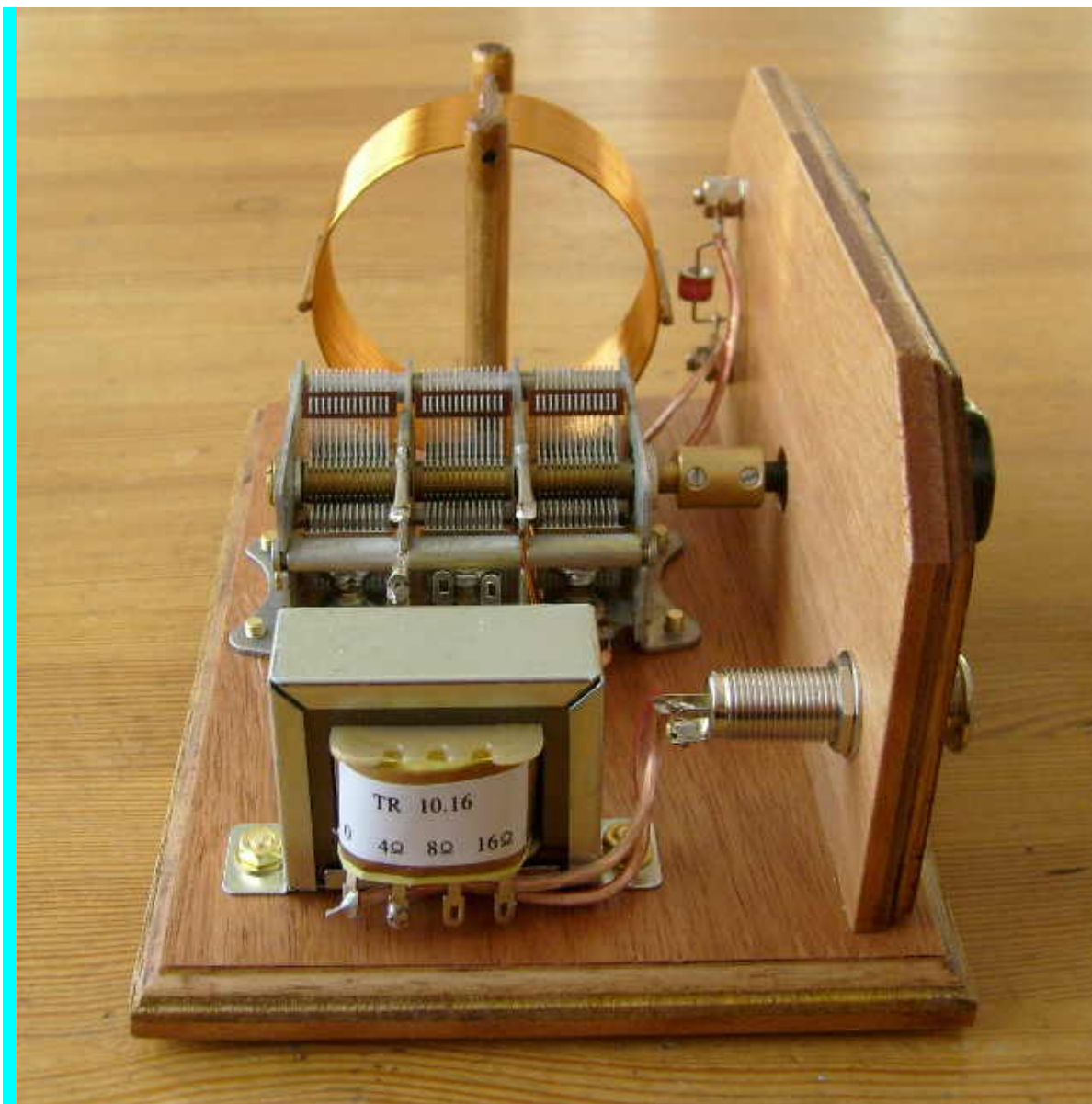
The other wire is cut to length, and soldered to the solder tag of the tuning capacitor (indicated with arrow).



Place the transformer on the frame, fix it with two M4x16 screws, 2 rings and 2 nuts
The wire of the 68 nF capacitor must stick through the "0" connection of the transformer, and is then soldered.
Solder the OA95 diode between tuning capacitor and the "0.625W" connection of the transformer.
The green band on the diode must point towards the transformer.



Overview of the components.

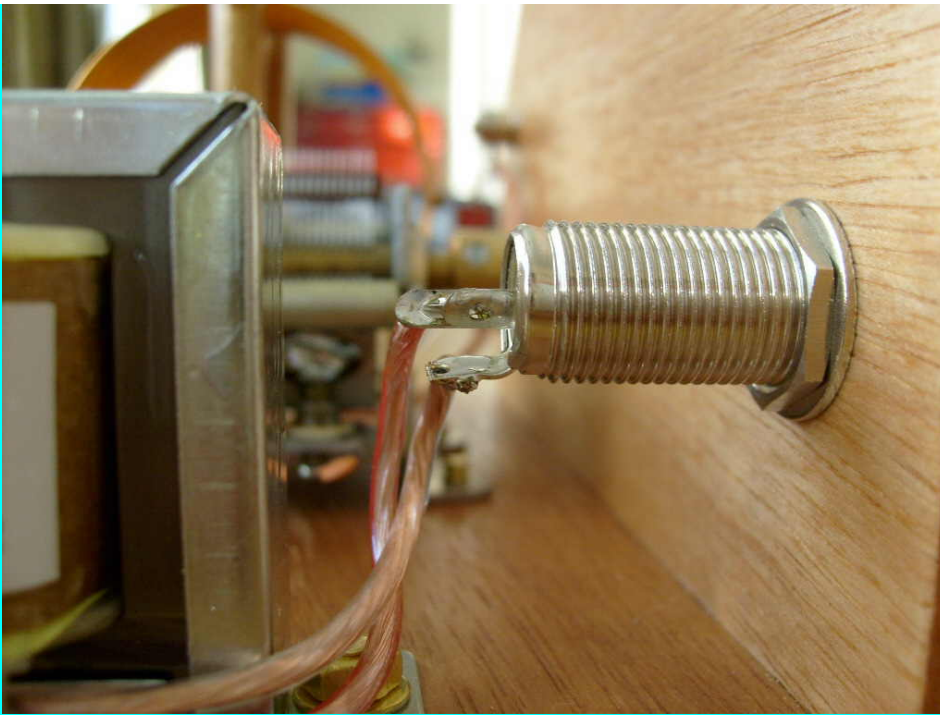


Solder the two wires from the transformer to the headphone socket (see for detail: next picture).

Solder the two wires from the tuning capacitor to the terminal posts.

The wire with the red line on it, comes on the upper (antenna) connection.

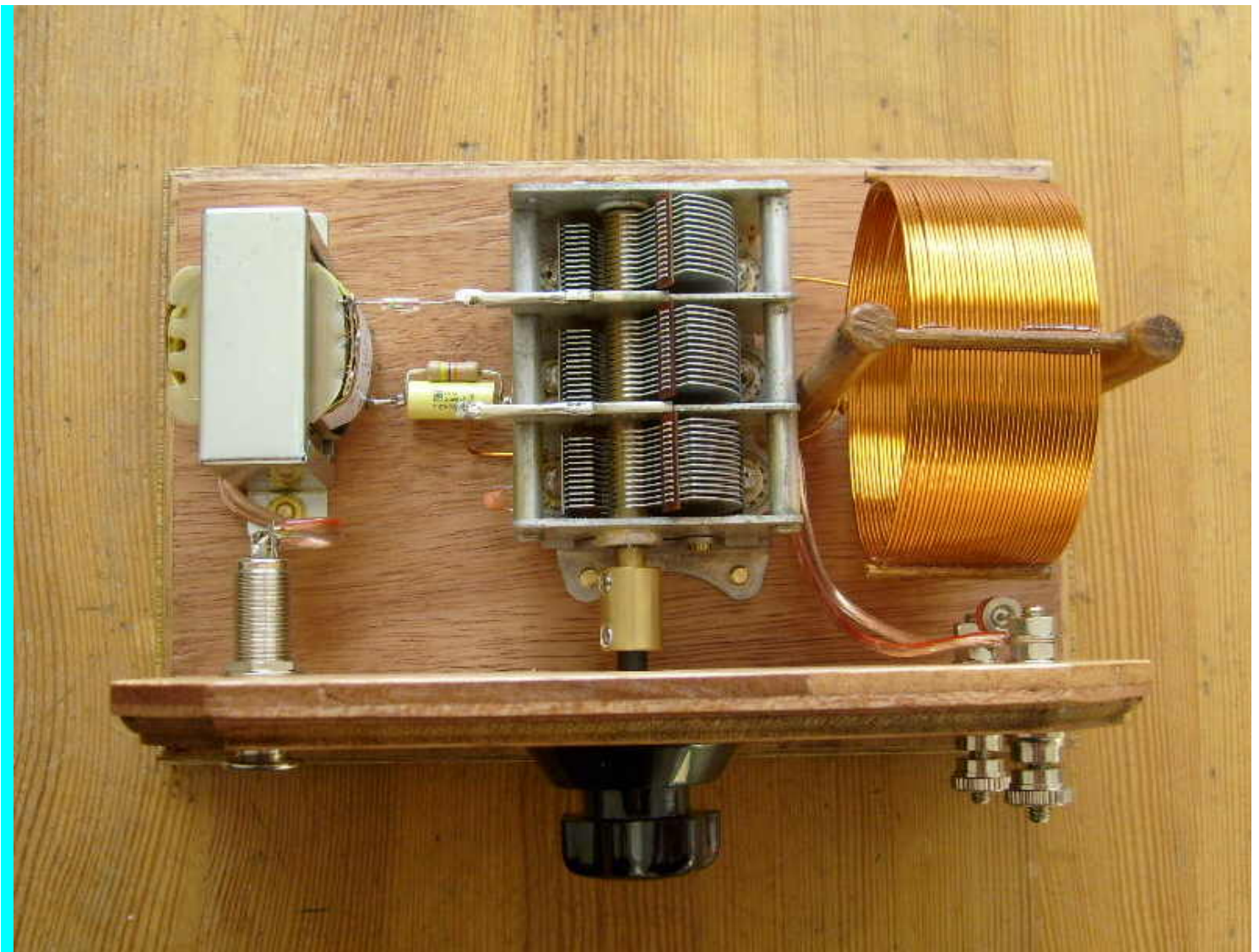
The wire without red line, comes on the lower (ground) connection.



Detail of the wires on the headphone socket.

The wire without red line comes on the ground connection.

The wire with the red line comes on the two signal pins, so these two signal pins are connected together.



Mount the extension shaft and the knob on the tuning capacitor.
In the middle position, the pointer on the knob must point upwards.

The radio is now ready !

[Back to the index](#) [back to set 11](#)

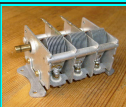

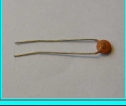



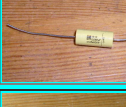
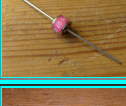





Crystal receiver set 11

Part list



[Back to the index](#) [back to set 11](#)


All components can also be ordered separately.

The pictures can be enlarged by clicking on it.

Quantity	Order code	Article description	Total price (euro)	
1	3x 500 pF	Tuning capacitor 3x 500 pF	7.50	
8.6 m	Copper wire 0.8 mm	Solid enamelled copper wire 0.8 mm	2.15	
1	39 pF 500 V	Ceramic capacitor 39 pF 500 Volt	0.25	
1	OA95	Germanium diode OA 95	1.00	
1	TR10.16	Audio transformer TR10.16	No longer available	
1	47 kOhm 1 Watt	Resistor 47 k.Ohm 1 Watt	0.10	
1	68 nF 630 V	Capacitor 68 nF 630 V axial	1.20	
1	N81-A90X	Gas discharge tube 90 volt	3.20	
1	NYS211	6.35 mm headphone socket stereo	2.00	
2	Terminal post 2BA	Terminal post 2BA	4.00	
2	Solder tag 5.3 mm	Solder tag 5.3 mm	0.30	
1	Knob 42 mm	Knob 42 mm	No longer available	
1	Shaft 6x39 mm	Plastic extension shaft 6 mm diameter 39 mm long	0.45	
1	Shaft coupler 6mm	Shaft coupler 6 mm	2.15	

					
0.2 m	2x 0.75 qmm transparent	Copper wire 2x 0.75 mm ² with transparent insulation	0.30		
2	Stick 2.5 x 170 mm	Wooden stick Lacquered	0.10		
2	Stick 9 x 100 mm	Wooden stick Lacquered and drilled.	0.30		
1	Set 11 frame	Bottom plate + front plate for set 11. Drilled, routed and varnished.	No longer available		
4	Screw 3x 45 mm	Screw 3x 45 mm	0.28		
6	Screw M4x16 brass	Screw M4 x 16 mm brass countersunk head	1.20		
2	Nut M4 brass	Nut M4 brass	0.20		
2	Ring M4 brass	Ring 4 mm brass	0.10		
4	Adhesive feet felt 22 mm	22 mm round adhesive feet made of felt	0.60		

Option	Order code: Antenna set 11	10 meter antenna wire 0.75 mm ² PVC insulation 3 meter earth wire 0.75 mm ² PVC insulation with clip	€ 10.00		
--------	-------------------------------	---	---------	---	---

Option	Order code: HD-202	Headphone Sennheiser HD-202 2x 32 Ω	€ 40.00	
--------	-----------------------	--	---------	--

[Back to the index](#) [back to set 11](#)